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Fair crack of the whip? The distribution of augmented wealth in Australia from 2002 to 2018

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Abstract
The omission of pension wealth potentially distorts the international comparison of wealth distributions. Private pension wealth is often included in households' wealth portfolios, while public pension claims are not. Augmented wealth, the sum of net worth and pension wealth, resolves this limitation by including the present value of social security pension wealth. This article provides a detailed analysis of augmented wealth in Australia between 2002 and 2018, capturing the establishment of the compulsory private pension scheme, Superannuation, which was introduced in 1992. Augmented wealth is slightly less equally distributed in Australia than in Germany or Switzerland but more equal than in the United States. The article also explores the relationship between Superannuation dissaving rates and the means-tested public pension scheme, Age Pension, and its distributional implications.

Keywords Augmented wealth · Net worth · Pension wealth · Inequality · Household income and labour dynamics in Australia survey

JEL Classifications D31 · H55 · J32

1 Introduction

The analysis of wealth distributions has gained more and more attention worldwide throughout the last decade. A highly unequal distribution of wealth can negatively affect growth and

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innovation (Bagchi and Svejnar 2015; Berg et al. 2018) and raises concerns about an unequal distribution in welfare Stiglitz (2012).

Pension wealth challenges the comparability of wealth data across countries (Bönke et al. 2019; Frick and Headey 2009; Kuhn 2020; Wolff 1996). Private pension wealth is often included in wealth surveys and, therefore, in wealth distributions, while public pension entitlements are not. Several studies showed, however, that public pension wealth is an (imperfect) substitute for net worth (Attanasio and Brugiavini 2003; Wolff 2015).[1] Hence, augmented wealth, i.e., net worth plus private and public pension wealth, contribute to a sincere comparison of international wealth distributions incorporating a more reliable measure of economic well-being (Wolff 2015; Bönke et al. 2019). Moreover, pension wealth aggregates are a helpful tool in a panel analysis to understand the distributional effects of pension policies.

Australia is particularly interesting for an assessment, as the country introduced a private pension scheme relatively recently in 1992 Kingston and Thorp (2019). Today's pension system relies on two main schemes, i.e., the means-tested social security pension system, Age Pension, and the private pension system, Superannuation. With its introduction, the Australian government[2] aimed to provide a sustainable and effective pension scheme that secures a commensurate income level and consumption during retirement. It includes compulsory employer contributions to the employee's Superannuation accounts, relieving pressure from the established, tax-funded Age Pension. Superannuation is mostly a defined contribution scheme for employees and employers. It is designed to increase private savings and retain and guarantee the standard of living for future retirees (Superannuation (Objective) Bill 2016; Productivity Commission Inquiry Report 2018).

This paper explores the evolution of augmented wealth aggregates in Australia over time, including a policy analysis of the Australian pension system. The analysis comprises two main components: first, it provides the evolution of augmented wealth in Australia between 2002 and 2018 by describing the growth and distribution of the wealth aggregates. These results are compared to previous findings of Germany, Switzerland, and the United States, which have been analyzed similarly before.[3] Second, it yields an in-depth examination of the Age Pension and the Superannuation scheme, including the analysis of dissaving (also called drawdowns) patterns of Superannuation accounts, how they are affected by incentives from the Age Pension scheme, and whether they differ along the wealth distribution. I use the Household, Income, and Labour Dynamics in Australia survey, which provides five wealth modules at the household level between 2002 and 2018 Watson and Wooden (2002). Furthermore, it includes exhaustive pension information at the individual level.

[1] See Bönke et al. (2019) for further discussions.

[2] Henceforth, I will refer to the Australian government as a collective term for the different Coalition and Labor governments over time.

[3] Despite the increased data availability, the role of pension wealth in wealth distributions has been marginally studied. Harding (2002) analyzes pension wealth, especially Superannuation accounts in Australia, and finds that the scheme reduces wealth inequality while overall wealth inequality remained constant between the 1980s and the 1990s. Frick and Headey (2009) compare Australian and German augmented wealth for the retired population in 2002 and find that including pension wealth reduces the observed inequality in both countries. More recently, Bönke et al. (2019) analyze augmented wealth in Germany and the US. They estimate that pension wealth accounts for 48 (61) percent of the US (German) household wealth. They also find an equalizing effect of pension wealth with a net worth Gini coefficient of 0.889 (0.755) compared to an augmented wealth Gini coefficient of 0.700 (0.508) in the US (Germany). Kuhn (2020) analyzes augmented wealth in Switzerland and finds similar results as in Germany.

This paper contributes to the existing literature on wealth inequality in Australia (Finlay 2012; Frick and Headey 2009; Ryan and Stone 2016; Sila and Dugain 2019; Wilkins 2016) by taking a first look at augmented wealth. Furthermore, I present a primary inter-temporal analysis of social security pension wealth. Additionally, this article contributes to the debated question of how a means-tested social security scheme associates with dissaving behavior patterns after retirement (Andréasson et al. 2017; Asher et al. 2017; Butt et al. 2021; Hulley et al. 2013; Kudrna 2016; Sneddon et al. 2016; Spicer et al. 2016). Including a detailed discussion on the Age Pension and Superannuation scheme, this article further contributes to the understanding of the enrollment phase of a relatively new private pension scheme and the lessons to be learned for other economies.

I find that Australian households, especially those with a household head aged 50 and older, realized significant wealth gains between 2002 and 2018. Despite large wealth increases, inequality remains stable in Australia. After housing wealth, Pension wealth has an equalizing effect, as the Gini index in 2018 reduces from 0.66 for net worth to 0.571 for augmented wealth. Comparing my findings to Germany, Switzerland, and the United States (US) (Bönke et al. 2019; Kuhn 2020), Australia's Gini index of augmented wealth is the second highest after the US, slightly above Germany and Switzerland. Furthermore, I find evidence that the means-test of the Age Pension servers simultaneously as an implicit tax and insurance function, supporting previous findings by (Andréasson et al. 2017; Asher et al. 2017; Butt et al. 2021; Hulley et al. 2013; Spicer et al. 2016). Based on my results, the paper concludes with a discussion about the long-run perspective of the Superannuation scheme, raising concerns as to whether the retiree population will diverge between those depending on Age Pension and those relying on Superannuation.

The remainder of this paper is as follows: Section 2 describes the Australian pension system in detail, Section 3 provides the applied methodology, Section 4 depicts the data, Section 5 presents the empirical findings, and Section 6 concludes.

2 Australian pension system

This chapter provides an overview of the Australian pension system. It builds on two main pillars: the social security scheme Age Pension and the private Superannuation scheme.[4] The Australian pension system contains several unique features. First, the means-tested social security pension is tax-funded, which does not rely on individuals' employment history, but on an income and asset test at the eligibility age. Second, the private occupational pension scheme Superannuation became compulsory in 1992 to provide additional incentives to build up private pension wealth Australian Government (1992). Third, Age Pension and Superannuation are not independent but interact with each other. Wealth and returns from Superannuation alter an individual's eligibility for Age Pension.

In this section, I describe the institutional settings of the different schemes and what has changed between 2002 and 2018. The information presented in this section is based on documentation and websites provided by the (Australian Government 2018, 2023).

[4] Some sources also report three pillars, meaning Age Pension, compulsory contributions to Superannuation funds, and voluntary savings, which includes additional investment into the Superannuation accounts or other investment vehicles. In the analysis, I focus on the two major schemes. Superannuation henceforth comprises both private and voluntary contributions. There are further smaller pension schemes, which are detailed in the Supplement Material B.1.

2.1 Age pension

General information The Age Pension scheme is a tax-funded, means-tested social security scheme. Individuals or households, who pass the income and asset test, are eligible for Age Pension at the age of 65 to 67. Additional to the full basic rate, which was \$629[5] for singles and \$834.40 for couples per fortnight in 2018, the Australian government provides several further payments, i.e., Rent Assistance, Energy Supplement, and Pension Supplement.[6] Moreover, individuals are entitled to the Pensioner Concession Health Card, providing higher refunds for health care costs. Depending on the state, local councils also offer additional discounts on property and water rates, public transport fares, or motor vehicle registration.

Eligibility conditions The first hurdle for eligibility for Age Pension is the individual's age and residency in Australia. In 2018, the eligibility age was 65 for both genders, i.e., cohorts born in 1953 or earlier. The residency rules demand that an individual has been living in Australia for at least ten years, five of these years without a break Australian Government (2018).

Income and asset test Singles or couples, who reach the eligibility age and meet the residency rules, are eligible for Age Pension if they pass the income and asset test. The income test includes gross labor earnings, pensions, received gifts, rental income, and financial gains. Retirees are allowed to work during retirement, but labor income above the work bonus, i.e., \$250 per fortnight, is included in the income test. The income test does not consider realized financial returns, but imputed, "deemed" returns based on total financial assets Australian Government (2023).[7] The Australian government provides low and high interest rates[8], which are multiplied by the value of the financial assets below and above the threshold, respectively. The deeming rates are adjusted on a non-regular basis by the Australian tax authorities Australian Government (2023). The asset tests inquire about the level of net worth, including real estate, business assets, financial wealth, Superannuation accounts, and valuables. Real estate does not include the principal home. However, different thresholds apply for homeowners and non-homeowners, providing a higher allowance for the latter. In 2018, the total wealth threshold for the full pension for singles (couples) without owning their home was at \$465,500 (\$594,500), whereas homeowners were allowed to own \$258,500 (\$387,500).[9]

Full vs. partial pension Individuals and couples can qualify for a full or partial Age Pension, depending on their level of income and wealth. Once they earn more than the first threshold, i.e., \$172 (\$304) per fortnight in 2018, every additional dollar reduces the payment by a reduction rate, which was for singles (couples) 0.5 (0.25) in 2018. The wealth thresholds for the partial pension are considerably higher than those for the full pension, which were \$771,000 (\$1,055,000) for non-homeowners, and \$564,000 (\$848,000) for homeowners.

[5] 1 AUD = 0.7405 USD = 0.6325 EUR on 30th June 2018.

[6] In 2018, Rent Assistance added up to \$128.00 (\$135.80) for singles (couples) per fortnight, Energy Supplement another 10.60 (\$14.10), and Pension Supplement \$51.10 (\$67.80). For more information, the Table A1 in the Appendix.

[7] The corresponding asset base includes the market value of savings accounts and term deposits, managed investments, loans and debentures, listed shares and securities, gifts, and Superannuation accounts.

[8] Also called deeming rates: the lower rate was 1,75 percent, the higher rate was 3.25 percent per year in 2018.

[9] This shows that the scheme considers sharing resources of couples and therefore provides lower payment and lower threshold compared to two single individuals.

Table 1 Eligibility

Type	2002	2006	2010	2014	2018
Eligibility Testing					
Income Test					
single threshold full	116	128	146	160	172
couple threshold full	204	228	256	284	304
single threshold partly	1,185	1,391.75	1,578.20	1,868.60	2,004.60
couple threshold partly	1,979	2,328.50	2,415.20	2,860	3,066.80
work bonus	0	0	250	250	250
reduction rate single	0.4	0.4	0.5	0.5	0.5
reduction rate couple	0.2	0.2	0.25	0.25	0.25
Deeming					
cash free	500	500	500	500	500
interest rate low	0.025	0.03	0.03	0.02	0.0175
interest rate high	0.04	0.05	0.045	0.035	0.0325
single threshold	34,400	38,400	43,200	48,000	51,200
couple threshold	57,400	63,800	72,000	79,600	85,000
Asset Test					
single w. house full	145,250	161,500	181,750	202,000	258,500
single no house full	249,750	278,500	313,250	348,500	465,500
couple w. house full	206,500	229,000	258,000	286,500	387,500
couple no house full	311,000	346,000	389,500	433,000	594,500
single w. house partly	288,000	330,000	659,250	771,750	564,000
single no house partly	392,500	447,000	790,750	918,250	771,000
couple w. house partly	443,500	509,500	978,000	1,145,500	848,000
couple no house partly	548,000	626,500	1,109,500	1,292,000	1,055,000
reduction rate	3 per 1,000	3 per 1,000	3 per 1,000	3 per 1,000	3 per 1,000
Year of Birth for Eligibility					
Female	1940	1944	1948	1949	1953
Male	1937	1941	1945	1949	1953
Payments per fortnight					
Age Pension					
pension single p. ft.	352.10	402.40	496.30	585.50	629.00
pension couple p. ft.	421.80	478.50	658.40	776.70	834.40

Notes: Table provides thresholds for the income and asset test, deeming, and payments for Age Pension. Further payments are provided in Appendix A.1. All values are provided in AUD. As the numbers represent the thresholds of the respective years, they are not adjusted for inflation. Following the official approach, most values, apart from the Asset Test and Deeming, are calculated per fortnight.
Source: Information is taken from (Australian Government 2018, 2023)

There are strong incentives to be at least partially eligible for Age Pension, even if the payment is low, as they are eligible for the benefits of the Pensioner Concession Health Card.

Changes between 2002 and 2018 There were several policy changes and adjustments in the Age Pension scheme. The Age Pension benefits, as well as the income and asset test thresh-

olds, are adjusted bi-annually.[10] Table 1 depicts the changes in rates and thresholds valid in July of the years considered in my analysis. The threshold for income tests increased steadily over the years. However, those for partial pensions nearly doubled for singles, whereas those for couples increased by around two-thirds. The asset thresholds increased relatively steadily but were actively adjusted by the Federal Government in 2017: the full pension thresholds were increased, while the thresholds for the partial pension were reduced, explaining the difference between 2014 and 2018, provided in Table 1. Between 2006 and 2010, the reduction rate for the partial pension increased from 0.4 to 0.5 (0.2 to 0.25 for couples). The Age Pension payments also increased in 2009 Australian Government (2009).

At the beginning of the observed period, in 2002, women could qualify earlier for Age Pension than men. The eligibility age for women increased from 62 to 65 between 2002 and 2014. Another transition for both women and men started in 2018, which will gradually raise the eligibility age to 67 by 2024. The 2018 wave is partially affected, as the eligibility age for those born after July 1952 and before 1954 can retire at the age of 65 and a half.

2.2 Superannuation

General information The Superannuation scheme represents, for most Australians, an investment in an accumulation fund.[11] The fund can be managed by financial institutions (retail funds), by the employing company (corporate funds) or industry (industry funds), by the public sector for civil servants (public sector funds), and by the individuals themselves (self-managed funds).[12] The total wealth in Superannuation accounts was $3.3 trillion in 2022 ASFA (2023), i.e. about 1.5 times the annual Australian GDP.

The choice of the Superannuation fund is not always subject to the employee since enterprise agreements can specify the fund type.[13] The Australian government sets standards for employee contributions and compulsory monthly contributions for employers, i.e., the Superannuation Guarantee, which is at least 9.5 percent of the monthly wage in 2018.[14] Additionally, individuals can invest further savings from their gross or net income. The withdrawal after the preservation age, i.e., 60 in 2018, is unlimited and free from income taxes. Low-income earners qualify for a governmental supplement contribution match of 50 percent, capped at $500 per year. Superannuation savings are liable to tax Australian Tax Office (2023). The tax rate depends on the type of contribution. Most commonly, contributions are taxed lump-sum at 15 percent. These are "concessional" contributions, including compulsory payments by the employer.[15]

Changes between 2002 and 2018 In the first year of my analysis, the compulsory Superannuation scheme was ten years old and, therefore, relatively new. Several policy changes and

[10] Until 2007, this was done based on the Consumer Price Index (CPI). After introducing the Pensioner and Beneficiary Living Cost Index (PBLCI), the rates are increased by whichever index is greater.

[11] Even though Australians potentially possess several Superannuation funds, I refer to them in the singular.

[12] Industry and retail funds include more than 11 million members each out of a total 27.4 million accounts and are the most dominant fund categories in 2019 Australian Prudential Regulation Authority (APRA) (2019).

[13] This affects around 30 percent of all receivers Australian Government (2023). Theoretically, employees could set up their own funds and transfer the money from the default fund. However, this is costly. I gratefully thank Roger Wilkins for this remark.

[14] The term "Guarantee" can be misleading, as it may imply a defined benefit later in retirement. However, it describes the monthly contribution to the Superannuation scheme and does not represent a "guaranteed" income flow during retirement.

[15] A detailed discussion on the taxation of Superannuation funds is provided in the Supplement Material B.2

Table 2 Concessional contributions cap

Age	2009	Age	2010	Age	2014	Age	2018
< 50	50.000	< 50	25.000	< 59	25.000	all	25.000
> 50	100.000	> 50	50.000	> 59	35.000	ages	

Notes: Table shows the change of the concessional contribution cap over time. Values in earlier years were the same as in 2009. All monetary values are in AUD and not adjusted for inflation.
Source: Information is taken from Australian Tax Office (2023)

adjustments have been made in successive years, of which several were of a larger scale. This includes the rise of the preservation age, changes to the concessional contributions cap, the end of the Superannuation surcharge in 2005, and the introduction of the Division 293 tax.

In 1999, the preservation age gradually increased from age 55 to 60. Those born before 1960 could access their Superannuation savings at 55. However, the preservation age increased year by year to 60 for those who were born after June 1964. This means that from 2015 onward, individuals access their accounts a year later. An even more substantial change could be the reduction of the concessional contribution cap. As shown in Table 2, the cap was reduced from $100.000 to $25.000 in the 2010s. Moreover, the age-specific caps were abolished. Consequently, the potential tax advantages per year for Superannuation savings are significantly lower compared to the end of the previous decade. Another considerable change was the abolition of the Superannuation Surcharge in 2005, which increased the tax rate by 12.5 percent and was applied to contributions from individual earnings of more than $121,075. Nonetheless, in 2012, a new type of surcharge tax was introduced, the Division 293 tax. It increases the Superannuation tax rate by 15 percent for individuals earning more than $250,000 ($300,000 until 2017). In July 2017, the Australian Tax Office introduced the $1.6 million cap to the tax-exempt status, with a 15 percent tax rate for the amount above.[16]

2.3 Interactions between superannuation and age pension

The Superannuation system was introduced as an additional pillar to support private wealth accumulation Australian Government (1992). Due to its design, it affects Age Pension eligibility twofold: deemed income from Superannuation wealth is included in the income test, and the total wealth in Superannuation accounts is included in the asset test. In 2016, the Australian government projected in the Superannuation (Objective) Bill (2016) that the proportion of retirees receiving no Age Pension will remain stable until 2050 at 20 percent of the population. Due to the maturity of the Superannuation scheme, they expect a shift away from full to partial eligibility of Age pension payments.

These interactions are highly relevant for understanding how the introduction of the private pension scheme affects its public counterpart. Individuals face new inter-temporal consumption decisions through their accumulation and retirement phase Australian Government (2020). Phasing out regulated Age Pension payments by individually chosen amounts from Superannuation accounts causes new dissaving decisions, which are affected by the incentives set by the two pension schemes. Two major channels of interaction have been

[16] There were smaller adjustments in the 2002 to 2018 period. The introduction of excess concessional contributions charge was introduced in 2013, which declined gradually from 5.82% to 4.96% until 2018. The governmental supplement contribution started in the same year. Originally, the contribution per invested $ 1 was $1.5, but reduced to $0.5 in 2018. The Superannuation Guarantee increased moderately from 9 percent to 9.25 percent in 2013 and to 9.5 in 2014.

proposed by the literature: first, the Age Pension means-test can be considered as an indirect tax on (Superannuation) wealth and incentivizes retirees to withdraw wealth at a faster rate (Asher et al. 2017; Butt et al. 2021; Hulley et al. 2013; Spicer et al. 2016). Second, the means-test can serve as insurance against investment losses and, hence, spur investments into risky assets (Andréasson et al. 2017; Andréasson and Shevchenko 2017; Butt et al. 2021; Hulley et al. 2013; Spicer et al. 2016). Consequently, the overall effect on Superannuation dissaving decisions is debated, as these two interactions potentially overlap. While (Sneddon et al. 2016; Australian Government 2020) conclude that there is little evidence of a strong interaction, theoretical models and empirical assessments by (Andréasson et al. 2017; Asher et al. 2017; Butt et al. 2021; Hulley et al. 2013) show that optimal paths for decumulation are affected by Age Pension. Moreover, the importance of these channels may vary across the wealth distribution contributing to higher (lower) saving rates at the bottom (top) as found in (Asher et al. 2017; Hulley et al. 2013; Spicer et al. 2016). I further investigate these channels of interaction. This is of interest for policy implications beyond the Australian case, as policymakers in other countries may learn from it.

3 Methodology

In this Section, I define augmented wealth and its underlying aggregates following (Bönke et al. 2019; Wolff 2015). I apply the accrual method, i.e. basing pension entitlements on the household's socio-economic characteristic at the observed point in time. Finally, I present the methodology for analyzing the dissaving patterns of Superannuation accounts during retirement.

3.1 Wealth aggregates

The augmented wealth definition applied here is closely related to the definition established by Bönke et al. (2019). I define the same 15 wealth aggregates as listed in Table 3. The gross wealth (w6) is the sum of w1 to w5, including owner-occupied property (w1), other additional real estates (w2), tangible assets (w3), business assets (w4), and financial assets (w5). Subtracting debts, i.e. debts from owner-occupied property (w7), from other real estates (w8), and consumer debts (w9), from gross wealth, I receive net worth (w10). Statutory pension wealth without (w11), from (w11s) survivor benefits, and after dissaving pension wealth (w11d) add up to the social security pension wealth (w12). Pension wealth (w14) is, therefore, the sum of social security pension wealth (w12) and occupational and private pension wealth (w13). Augmented wealth (w15) is the sum of net worth (w10) and pension wealth (w14).

While aggregates w1 to w10 are standard for the distributional analysis of wealth, aggregates w11 to w15 allow for a broader perspective on wealth endowments. Private pension wealth, w13, represents wealth in Superannuation funds, which potentially is included in financial assets in standard wealth analysis. The w12 aggregate represents the present value of discounted income flows from social security pensions, listed in Table A8 above. In other words, the value considered as social security wealth is the actuarially fair, discounted price to which an individual would sell their social security pension claims on a complete capital market. Hence, the measure incorporates social security entitlement as the present value of

Table 3 Wealth aggregates

Acronym	Variable
w1	Owner-occupied property
w2	Other real estate
w3	Tangible assets (collectibles)
w4	Business assets
w5	Financial assets
w6	**Total gross wealth (sum up w1 to w5)**
w7	Mortgage debts - owner-occupied property
w8	Mortgage debts - Other real estate
w9	Consumer debts
w10	**Net worth (w6-(w7 + w8 + w9))**
w11	Statutory pension wealth without survivor benefits
w11s	Statutory pension wealth from survivors benefits
w11d	Statutory pension wealth after dissaving Superannuation accounts
w12	**Social security pension wealth (w11 + w11s + w11d)**
w13	**Occupational and private pension wealth**
w14	**Pension Wealth (w12 + w13)**
w15	**Augmented wealth (w10 + w14)**

Notes: Description of the 15 wealth aggregates according to Bönke et al. (2019), p.12. This analysis adds w11d, which includes statutory pension wealth, which households may are eligible to after dissaving their Superannuation account

pension p for individual i in year y and is defined as

$$PV^{p}_{i,y} = \sum_{t=0}^{T}[\frac{1}{(1+r)^t}\sum_{p}\sum_{t} d^{P}_{t,i,y} \times pension^{p}_{t,i,y} \times \sigma_{t,g,c,y}], \tag{1}$$

where T is the "end-of-life" period, when the individual reaches the age of 100, r is a constant discount rate, i.e. 2 percent. $d^{P}_{t,i,y}$ is equal to 1 if individual i is eligible for pension p in period t. $pension^{p}_{t,i,y}$ represents the pension entitlement and $\sigma_{t,g,c,y}$ is the probability of staying alive in period t depending on gender g in cohort c in year y. The survival probability is provided by Australian Bureau of Statistics (2023) for the waves under analysis.

I assume that individuals who receive social security pension in year y remain eligible throughout the rest of their life cycle. This assumption is realistic for individuals receiving less common pension types, e.g. Disability Pension, Disability Support Pension, Service Pension, or War Widow Pension. Individuals receiving Age Pension could potentially lose their eligibility, from one period to the next, if they failed the income and asset test, e.g. by starting to work or having increased capital gains. This is however rare.[17] A reasonable concern could be that individuals lose their Age Pension eligibility due to policy adjustments. As the accrual method relies on the *to-date* expected value of futures pension schemes, it does not include future policy changes in year y. Once these changes are introduced, they affect the present value calculation.

The statutory pension wealth from survivors pension (w11s) includes the Widow Allowance, the only scheme where the payment $pension^{p}_{t,i,y}$ depends on the male part-

[17] I provide more evidence for this in Sections 4 and 5

ner's survival probability. Eligibility is conditioned on being female, born on or before 1 July 1955, being widowed, divorced or separated since turning 40. Women have to meet the requirements of the income and assets test and meet residence rules, i.e. living in Australia for at least 10 years. In Eq. 1, this means that the survival probability is, therefore, $(1-\sigma_{t,m,c,y}) \times \sigma_{t,f,c,y}$.[18] The economic relevance remains small, as only 0.2 percent of the whole population was eligible in 2014, and the program stopped in 2018.

Including social security pension wealth and its effect on Australian wealth inequality builds the basis of the contributions of this paper. As social security pension wealth is financed with taxes, the contribution to the tax system is indirectly included in the classical wealth analysis. Social security pension wealth increases tax rates, potentially reducing household net incomes and, eventually, hindering wealth accumulation compared to a situation without a tax-based pension scheme. It potentially affects the wealth aggregate directly, as it reduces net wealth. Incorporating social security pension wealth, therefore, provides a more accurate wealth measure as it includes the benefits of the pension system.

Even though my methodology is closely related to the ones by (Bönke et al. 2019; Kuhn 2020), the peculiarities of the Australian pension system compared to Germany, Switzerland, and the US cause some deviation. The social security schemes in these three countries are pay-as-you-go schemes relying on individual labor income histories and associated pension contributions. Hence, they can calculate the present value of their pension contributions at any point in their life cycle. In these countries, tax-funded social security pensions exist as basic income support for those with a lower lifetime income. As these payments are not just a pension scheme, they are not included in the present value calculation by (Bönke et al. 2019; Kuhn 2020). However, in my analysis, I include them in the present value calculation because Age Pension is the major social security scheme in Australia.

As I cannot observe whether cohorts below the eligibility age will qualify for Age Pension, I only include their savings in Superannuation accounts in the main analysis. Neglecting Age Pension entitlements before eligibility in my baseline analysis minimizes additional assumptions regarding the eligibility and the potential size of the Pension Age payments, but it also incurs two major concerns: first, the baseline approach underestimates the present value of the Pension Age scheme lessening the international comparability. Second, Australians can be informed by their Superannuation fund trustees about their potential income stream from Superannuation and Age Pension in the future. Therefore, their wealth accumulation strategies are potentially affected by future Age Pension entitlements and the baseline approach potentially provides a distorted outcome. To address these points, I provide robustness checks, imputing Pension Age entitlements for those who are not eligible. For this, I use the information in Table 1 in Section 2 and Table A1 in Appendix A.1 to run an *artificial* Age Pension eligibility test. This is possible as the pension information is available on the individual level in HILDA. Moreover, I use current income streams and wealth levels to impute full or reduced Pension Age payments. Then the present value is calculated as in Eq. 1 above.[19]

I provide two additional configurations as robustness checks: the first 'extended' robustness check tests the future Age Pension eligibility of all individuals above 50 years of age in the respective year. The second one, the 'maximum' robustness check, tests all individuals above the age of 18. The latter is rather unrealistic because individuals at the beginning of their working live typically do not hold significant amounts of wealth and their development

[18] I refrain from including divorce rates and focus on survival probabilities.

[19] Naturally, the eligibility starts between 62 and 65 in the observed periods. This means that for a 50-year-old individual, the first Age Pension payment is discounted between 12 and 15 years.

over the life cycle is unknown. Nevertheless, it shows a technical maximum for my measure of social security pension wealth.

Calculating dissaving rates and aggregate w11d Another central aspect is the interaction between Age Pension eligibility and Superannuation wealth. Once individuals reach the preservation age, the government lets individuals choose how much they retrieve per year. As Superannuation is included in the Age Pension income and asset test, there can be an incentive for those who are slightly above the income and wealth thresholds to dissave Superannuation wealth at a higher rate. Contrary to other financial assets, this would not affect the individual tax rate[20] and one could potentially fulfill the income and asset test requirements Hulley et al. (2013). For this reason, I apply the artificial income and asset test, as above, for the different definitions of social security pension wealth, for those who reached the eligibility age and meet the residency rules. I calculate the average Superannuation dissaving rate $\overline{v_{c,y}}$ for each cohort c in year y: the means-test can be considered as an indirect tax on (Superannuation) wealth and incentivizes retirees to withdraw wealth at a faster rate

$$\overline{v_{c,y}} = \frac{1}{N_{c,y}} \sum_{i=1}^{N} \frac{y^s_{i,c,y}}{w^s_{i,c,y}} \tag{2}$$

with $y^s_{i,c,y}$ describing the annual amount retrieved from Superannuation wealth by individual i, and $w^s_{i,c,y}$ representing the individuals total Superannuation wealth. $N_{c,y}$ is the total size of cohort c in year y. I assign the average dissaving rate to those individuals who would pass the artificial income and asset test by reducing their Superannuation in each period of the present value calculation in Eq. 1. Aggregate w11d is then calculated as the present value similar to the other pensions in Eq. 1. As soon as individuals are eligible, the dummy variable $d^P_{t,i,y}$ switches from 0 to 1, and the individuals receive $pension^{p,imputed}_{t,i,y}$ from this period onward.[21]

Analysis of dissaving rates I shed more light on the interaction between the two main pension schemes by scrutinizing dissaving rates. I estimate a pooled fractional probit model. The advantage of this is that compared to a binary probit model, I can take the intensive margin of the continuous dissaving rate into account. The fractional probit model was introduced by Papke and Wooldridge (1996), who analyze aggregated employee participation rates in 401(k) pension plans in the US. The model has the following form:

$$E(v_i|X_i) = \Phi(X_i\beta_j) \tag{3}$$

where v_i represents the dissaving rate, and X_h represents a set of the covariates of individual i and the intercept. $\Phi()$ represents the standard normal cumulative distribution function.

4 Data

The main source of my analysis is the Household and Income Dynamics in Australia (HILDA) Survey Watson and Wooden (2002). Additional data on the income and asset testing, as well as payments of the Age Pension scheme, is taken from the Australian Government (2018). This section describes the HILDA dataset, especially regarding the wealth modules. Furthermore, I define the working sample for analyzing Superannuation dissaving rates.

[20] E.g. returns from selling shares falls under the capital gain tax.

[21] This affects 7.91 percent of households with a retired household head in my working sample.

Table 4 Means of selected characteristics: HILDA

	2002	2006	2010	2014	2018
Obs	7,063	7,003	7,193	9,363	9,486
Age HH Head	48.08	48.70	49.07	50.00	50.54
	(0.13)	(0.14)	(0.14)	(0.14)	(0.13)
Numb HH	2.60	2.60	2.59	2.58	2.56
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Female HH Head (%)	45.92	46.31	48.39	47.64	47.57
	(0.39)	(0.41)	(0.42)	(0.40)	(0.42)
Yearly Eq. Inc HH	52,449	58,617	63,502	65,684	67,247
	(340)	(375)	(415)	(434)	(478)
Net Worth (Survey)	598,160	810,683	801,490	792,315	933,664
	(7,016)	(10,715)	(10,599)	(9,062)	(10,342)

Notes: Own calculation based on the full sample. Weighted monetary mean values are in AUD and set to 2018 prices based on the Consumer Price Index The World Bank (2021). Income is equalized by using the modified OECD scale Hagenaars et al. (1994). Net worth provided here follows the definition of the HILDA Survey, which includes Superannuation wealth Wilkins et al. (2020). All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights Efron (1979).
Source: HILDA Survey wave 18

Wealth data in HILDA The HILDA survey is representative of the Australian population and it has been conducted annually by the Melbourne Institute since 2001. I use the HILDA survey, as it includes, first, broad information on socio-economic characteristics and a detailed wealth module on the household level for the years 2002, 2006, 2010, 2014, and 2018. Second, it includes information on surrender pension values $pension^{p}_{t,i,y}$ from all Australian pension schemes on the individual level. Third, the panel survey allows me to track wealth pensions over time. Fourth, neither the wealth module nor the data collection methods have been changed over time so that I can rely on consistent information over 16 years.

Table 4 depicts the numbers of observation and mean values for selected variables in the HILDA survey over time. In 2002, 7,063 households are surveyed. With a top-up in 2011, more than 9,000 households are included since then. The household member answering the household questions is defined as the household head. The average age of the household head is close to 50, and the average number of individuals in a household is constant and around 2.6 in all waves, and 46 to 48 percent of the household heads are female. All monetary values in my analysis are provided in 2018 prices. The mean of the households' equivalent income increased in the 2000s from $52,449 to $63,502 and ends up at $67,247 in 2018. The mean net worth follows the definition of the HILDA Survey, which includes Superannuation wealth Wilkins et al. (2020) increases between 2002 and 2006 from $598,160 to $810,683, then decreases to $792,315 in 2014, and rises to $933,664 in 2018.

Wealth data based on survey information has the caveat that the top one percent are difficult to capture adequately (Eckerstorfer et al. 2016; Kennickell and McManus 1993). Oversampling of the rich potentially addresses this problem Kennickell (2008), but this is not provided by the HILDA survey. Moreover, wealth and income variables are top-coded, which affects 30 to 40 observations in each survey year.[22] Therefore, the results of my analysis do not incorporate changes for the top of the wealth distribution. Nevertheless, the HILDA

[22] The observations hold an imputed, mean preserving value. This affects the top 0.5 percent.

survey provides reliable wealth data for large parts of the population, which is surveyed consistently over time.

Working sample for the analysis of dissaving rates Data requirements potentially limit the analysis of dissaving rates. Long-term panel data with wealth modules are scarce. Even if panel wealth data is available, dissaving patterns are difficult to obtain, as the extraction values from private pension accounts are commonly not provided. The HILDA dataset allows me to observe both: I can observe the total Superannuation in five waves between 2002 and 2018 and, for every year, observe the amount retrieved from this account.

To estimate Eq. 3, I pool all waves with the wealth module from between 2002 and 2018. I rely on an individual information, as data on Superannuation accounts is one of the few wealth items which is provided on the personal level in the HILDA dataset. I restrict my dataset to retired individuals over 55 years of age who hold at least some wealth in their Superannuation accounts. This leaves 5,679 observations in total.[23]

5 Empirical findings

I show the empirical findings in three major subsections: the first part provides descriptive statistics of the wealth aggregates in Australia over time, including the analysis of augmented wealth inequality. The second part sets the results within the context of augmented wealth in Germany, the US Bönke et al. (2019), and Switzerland Kuhn (2020). The third part exhibits distributional implications of the Age Pension and Superannuation scheme, which incorporates the analysis of the individual Superannuation dissaving rate.

5.1 The distribution of augmented wealth and its components

This subsection describes augmented wealth inequality from several angles. Aside from mean values of the wealth aggregates, I illustrate the change in wealth levels along age cohorts. Moreover, I analyze the evolution of augmented wealth inequality.

5.1.1 The distribution of augmented wealth in Australia

Descriptive statistics Table 5 provides the mean values of the wealth aggregates w1, w5, w6, w10, w12, w13, and w15. All values are provided in Australian dollars and in 2018 prices. I observe a substantial increase in all wealth aggregates between 2002 and 2006, except for social security pension wealth. Mean gross wealth increased between 2002 and 2010, slightly decreased in 2014, and increased significantly to $896,743 in 2018. Net worth provides similar patterns. The estimates suggest that the homeowner residence value (w1) drives much of that development, as a comparably high ownership rate, i.e, around 65 percent in the total population Wilkins (2016) coincides with a steep increase in housing prices in Australia (Knoll et al. 2017; Ryan and Stone 2016; Wilkins et al. 2020). The mean of the financial wealth (w5) aggregate rises by around 40 percent during the 16 years, only stagnating between 2006 and 2010 – the time of the global financial crisis (henceforth GFC). Social security pension wealth remained relatively constant over time, with an increase in 2014 followed by a decrease close to the 2010 level at $75,805. I also include wealth from survivor benefits (w11s), which depend on widow allowance payments. Only very few households

[23] Further details on the sample are provided in Appendix A.2

Table 5 Selected weighted mean values based on HILDA

	2002	2006	2010	2014	2018
w1: HMR Value	307,381	407,842	443,434	420,146	508,951
	(2,834)	(3,884)	(4,224)	(3,674)	(5,145)
w5. Financial Wealth	101,038	125,351	121,199	134,375	147,243
	(2,142)	(3,252)	(3,093)	(2,850)	(3,225)
w6: Gross Wealth	575,738	805,250	809,938	775,967	896,743
	(6,692)	(10,869)	(10,249)	(8,296)	(10,053)
w10: Net Worth	474,784	650,131	624,835	589,465	692,618
	(6,002)	(9,672)	(8,933)	(7,073)	(8,668)
w11s: PW from survivor benefits	22	225	629	676	0
	(7)	(7)	(19)	(25)	(0)
w11d: PW after dissaving Super	1,102	769	1,315	2,056	3,403
	(132)	(105)	(139)	(194)	(257)
w12 Social Security PW	70,242	73,415	71,800	81395	75,805
	(1,219)	(1,457)	(1,375)	(1,563)	(1,478)
w13: Superannuation	123,280	160,876	177,978	203,086	240,726
	(1,979)	(2,911)	(3,245)	(2,761)	(3,135)
w15: Aug. Wealth	668,306	884,422	874,613	873,946	1,009,149
	(6,865)	(10,999)	(10,979)	(8,778)	(10,296)

Notes: Own calculation based on the full sample. Weighted mean values are in AUD and set to 2018 prices on the basis of the Consumer Price Index The World Bank (2021). All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18

receive pensions from this scheme and it stopped in 2018. The mean pension wealth from Age Pension after dissaving their Superannuation account (w11d) is higher than those from aggregate w11s, but not also not relevant for the overall wealth distribution.[24] The mean of Superannuation (w13) doubled between 2002 and 2018, which can be explained by the advanced maturity of the scheme in combination with a high take-up rate. The family home represents, on average, the most valuable asset in 2018, followed by Superannuation wealth, financial assets, and eventually, social security pension wealth.

Australian households, on average, yield high augmented wealth positions (w15). The aggregate increases greatly between 2002 and 2006, plateaued between 2006 and 2014, and increased again in 2018. During the considered 16 years, augmented wealth has increased by 51 percent. Increasing housing (households' main residence, HMR) wealth and Superannuation drive these results. Table 5 also shows the relevance of pension wealth, as the mean of augmented wealth is 45 percent higher than net wealth in 2018.

The pension schemes were affected by several policy adjustments and they may help to explain the changes over time. The rise of the eligibility age for women and the bi-annual adjustments of the thresholds and pension payments contribute to keeping the social security pension wealth values stable, even though the number of retirees has increased. The relatively steep upturn between 2010 and 2014 was likely due to a composition effect, as the eligibility age for women was successively increased from 60 to 65 until 2014. Therefore, several women had to postpone their retirement and become eligible in that year. The decrease of

[24] Henceforth, w11s and w11d are not presented separately.

Table 6 Descriptive statistics wealth aggregates: 2018

Aggregates	Mean	p10	p25	p50	p75	p90	Frac >0
w10: Net Worth	692,618	200	35,000	357,797	858,900	1,718,000	90.51
	(10,053)						(0.33)
w12 Social Security PW	75,805	0	0	0	0	357,809	21.07
	(1,478)						(0.44)
w13 Superannuation	240,726	0	16,628	95,000	275,000	600,000	84.88
	(3,135)						(0.12)
w15 Augmented Wealth	1,009,149	28,000	165,830	601,000	1,307,299	2,325,522	96.20
	(10,296)						(0.14)

Notes: Own calculation based on the full sample. Monetary values are in AUD. All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18

the mean from 2014 to 2018 might be a consequence of the rather large threshold adjustment in the income and asset test by the government and the first step of increasing the eligibility age to 67 for men and women.

Major changes in the Superannuation scheme, like the reduction of the concession cap in the early 2010s, reduced the Superannuation wealth growth. However, the results do not provide a counterfactual scenario, which would also be difficult to disentangle from the aftermath of the GFC at that time. The increase in the preservation age between 2014 and 2018 possibly increases wealth in Superannuation accounts as the accumulation phase is prolonged. This is, again, difficult to disconnect from the developments of international stock markets, which significantly rose in that period.

Looking beyond the mean, Table 6 provides the mean, median, 25th-, 75th-, and 90th percentiles of selected wealth aggregates in 2018. Typical for net worth is having a much lower median than the mean, indicating a highly rightly-skewed distribution, with $35,000 at the 25th –, $858,900 at the 75th –, and $1,718,000 at the 90th percentile, respectively. It also provides the ratio of households that hold a positive amount in the wealth aggregate. For net worth in 2018, these were 90.51 percent of all households. Social security pension wealth applies to 21.07 percent of Australian households. Superannuation is much more dominant in comparison to social security pensions, but its distribution is rightly skewed as well. 84.88 percent of Australian households hold at least some wealth in Superannuation accounts. Augmented wealth is considerably higher than net worth for all statistics shown in Table 6, and only 3.8 percent of all households do not possess positive augmented wealth.

Taking potential eligibility for younger cohorts into account increases the social security pension wealth component.[25] For the extended approach, the mean increases to $113,041 in 2018, while the theoretical maximum approach leads to a mean of $152,986. The fraction receiving Pension Age increases to 28.87 and 43.66 percent, respectively. While the increase in social security wealth is meaningful, the effect on augmented wealth is still relatively small. Interestingly, the increase is particularly large at the 25th and 50th percentile of the augmented wealth distribution. Therefore, especially those below the median benefit from the broader eligibility definition.

[25] The corresponding Table A3 is provided in Appendix A.3.

Wealth and age cohorts The longitudinal data allows me to compare wealth endowments of different age cohorts in the observed period. These results are helpful in understanding which age groups benefited and which aggregate contributed to the increase in wealth.[26]

Figure 1 shows the results with age referring to the household head. I calculate the mean wealth of 21 age cohorts. Each age cohort includes three years of age. For instance, household heads aged 22 to 24 in the second age cohort. The last age cohort comprises all households with a household head at the age of 80 or older. I plot the results for each wave using LOWESS regressions.[27] In the four panels, I depict augmented –, social security pension –, Superannuation –, and housing wealth.

Augmented wealth follows the same pattern in all considered waves, starting at a level close to 0 at the beginning of the life cycle and then a steady increase until the 60s, after which mean wealth values start to decline again. The estimates show, that the large increase of wealth between 2002 and 2006 seems to evaluate the wealth of those in their 50s and above. In the years 2010 and 2014, augmented wealth stagnated at the 2006 levels for all age cohorts. In 2018 augmented wealth increases again for older age cohorts, while the difference for those below their 50s is small.

While the patterns of social security pension wealth are very persistent over time, the plots confirm the previous finding that Superannuation wealth and housing wealth drive the increase of augmented wealth in these periods. Pension wealth from social security schemes starts to grow at the age of 50 in all years and then continuously increases almost linearly until the late 70s cohorts. There are other social security pension schemes included, e.g. the Service Pension or Disability Pension, which explains the take-off before the 60s. Social security wealth in 2018 appears to be slightly lower than in the cohorts before, but the difference is not significant. Increasing Age Pension eligibility does not affect these findings.[28] Superannuation wealth follows an inverted u-shaped pattern across the age cohorts and grows in every wave, but less during the time of the GFC.

The increase in Superannuation wealth between 2014 and 2018 is interesting, as several changes and economic factors interact in this period. The rise of the preservation age potentially increased wealth levels as the accumulation phase was prolonged. The reduced concessional rate, established in the 2010s, however, could have reduced accumulation patterns. Well-performing financial markets in that period potentially offset effects on the accumulation rates and raised wealth for all cohorts. In the cross-section, mean wealth reduces for households with a household head above the eligibility age. Mean values for household heads 80 or older get closer to zero for the waves 2002, 2006, and 2010 but remain at above $100,000 in the last two waves.

[26] The individual age determines the stage of wealth accumulation over the life cycle. Following the neoclassical theory, individuals choose their saving rate to smooth their consumption over time. Previous research shows an inverted u-shaped pattern of wealth accumulation throughout an individual's life, with an increase throughout the working life and a decline once an individual retires (Atkinson 1971; Davies and Shorrocks 2000). Many more factors shape the wealth accumulation patterns, e.g. saving rates, especially precautionary saving (Cagetti 2003; De Nardi and Fella 2017), investment behavior (Calvet et al. 2007; Benhabib et al. 2011; Lusardi et al. 2017; Wenzel and Koenig 2019), and bequest motives, either accidental De Nardi (2004) or due to the "warm glow" (Andreoni 1989; De Nardi and Fella 2017).

[27] Scatter plots with bootstrapped standard error for the years 2002 and 2018 are provided in Fig. A3 in Appendix A.4.

[28] I provide age cohorts across social security wealth and augmented wealth applying the extended and maximum definition in Appendix A.3. Naturally, Younger cohorts receive higher social security pension wealth holdings, but the effect on the augmented wealth patterns is small.

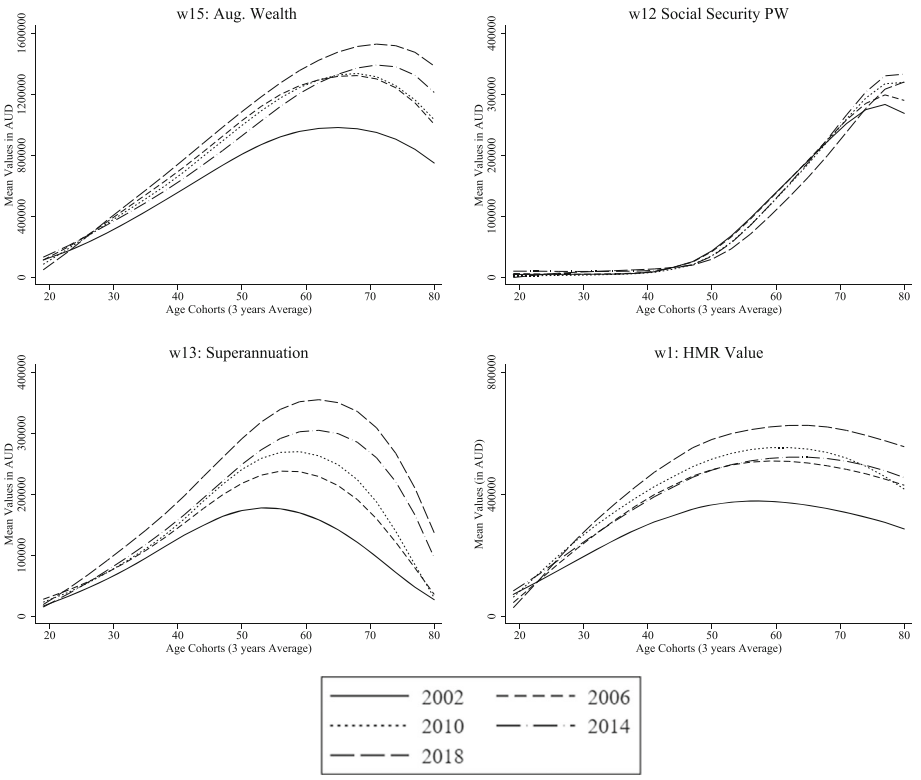


Fig. 1 Life cycle wealth profiles. *Notes:* Own calculation based on the full sample. The graph shows mean values of wealth for repeated cross-sections conditional on age. The three year average values by age cohort are smoothed with LOWESS. Age refers to HH Head. All values are in AUD and set to 2018 prices on the basis of the Consumer Price Index The World Bank (2021). *Source:* HILDA Survey wave 18

Housing wealth increases throughout the life cycle as homeownership becomes more and more relevant. Homeownership did not change significantly across age cohorts[29]. The increase is, therefore, fully attributable to increasing housing values.[30]

Wealth modules and inequality The results so far show substantial changes in the wealth endowment, which raises the question about the distributional consequences. The distribution of wealth in Australia has been studied before. Using data from the Australian Bureau of Statistics (ABS), Harding (2002) finds a net wealth Gini coefficient at 0.64 in 1986 and in 1998, which remained constant due to the equalizing effect of the Superannuation accounts. Later studies reveal estimates between 0.6 and 0.65 using ABS data Kaplan et al. (2018) or HILDA data (Headey et al. 2005; Frick and Headey 2009; Ryan and Stone 2016; Sila and Dugain 2019; Wilkins 2016). The trends over time are, however, controversial as Kaplan et al. (2018) describe increasing inequality, while (Sila and Dugain 2019; Wilkins 2016) find stable inequality patterns. Australian Bureau of Statistics (2021) finds an increase in the Gini index from 0,565 in 2003 to 0,619 in 2018. This paper contributes to the discussion by

[29] For a graphical representation see Appendix A.4.

[30] I further discuss pension wealth along several household characteristics in the Suplement Material B.3.

Table 7 Gini coefficients of wealth aggregates

Aggregates	2002	2006	2010	2014	2018
w10: Net Worth	0.644	0.661	0.649	0.661	0.664
	(0.0035)	(0.0040)	(0.0040)	(0.0032)	(0.0033)
w10 + w11: Personal Ent.	0.602	0.624	0.615	0.622	0.628
	(0.0035)	(0.0040)	(0.0040)	(0.0033)	(0.0034)
w10 + w12: Social Sec PW	0.602	0.624	0.615	0.622	0.628
	(0.0035)	(0.0040)	(0.0040)	(0.0044)	(0.0034)
w10 + w13: Superannuation	0.619	0.632	0.625	0.628	0.624
	(0.0035)	(0.0037)	(0.0039)	(0.0031)	(0.0030)
w15: Augmented Wealth	0.577	0.597	0.593	0.592	0.592
	(0.0033)	(0.0037)	(0.0039)	(0.0032)	(0.0030)
Net worth <= 0 (%)	7.66	9.41	9.75	10.93	11.10

Notes: Own calculation based on the full sample. All estimates are based on imputed values and weighted with household population weights. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18

providing a long-run analysis and by adding the, thus far, not included social security pension wealth aggregate.

Table 7 presents the Gini coefficients of net worth, adding up social security pension wealth and Superannuation to augmented wealth in the considered waves. Based on my estimates, the Gini index of net worth inequality increased slightly over time. Bottom coding or censoring does not alter the estimates veritably, as only a relatively small proportion of the distribution holds a negative net worth.[31] My estimates of the Gini coefficient correspond to previous estimations with HILDA data in (Headey et al. 2005; Frick and Headey 2009; Wilkins 2016). Aggregate "w10 + w13" comes closest to the net wealth definition in the survey, as it includes wealth from Superannuation accounts.

Adding pension wealth to the net worth distribution decreases the measured inequality, as augmented wealth exhibits lower Gini estimates than net worth in all waves. The Gini coefficient of augmented wealth increases slightly over time, i.e. from 0.577 in 2002 to 0.592 in 2018. The aggregates w11s and w11d have no distributional relevance, which is shown by the same estimates of "w10+w11" and "w10+w12". In 2002, net worth and social security pension wealth are slightly more equally distributed than net worth combined with wealth in Superannuation accounts. However, this changed by 2018, when both pension aggregates exhibited about the same level of inequality.

Enlarging the eligibility for social security pensions shows a slightly higher equalization effect. Adding the extended "w12" module to net worth reduces the Gini index by around 0.02 compared to the baseline specification in each year. Augmented wealth inequality then lies in between 0.560 and 0.572 in the considered timeframe.[32] When assuming the theoretical maximum reduction, the Gini of augmented wealth reduces further to 0.522 and 0.543, respectively.

Relatively constant Gini coefficients are not what one would necessarily expect in the Australian case. Economic growth can be observed constantly between 2002 and 2018, and it is, in advanced economies, associated with growing wealth inequality during the last

[31] Corresponding estimates are provided in Appendix A.5

[32] The estimates are provided in Table A5.

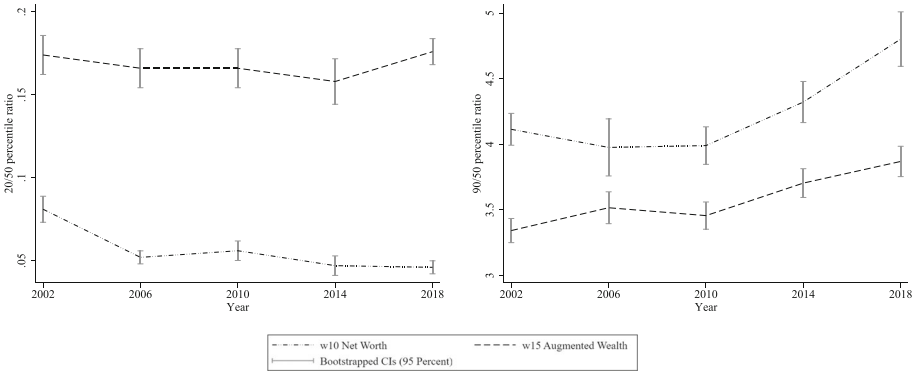


Fig. 2 Percentile ratios: 20/50 and 90/50. *Notes:* Own calculations based on the full sample. The left (right) panel provides the 20/50 (90/50) percentile ratio over time. All estimates are based on multiple imputations. Bootstrapped standard errors are based on 1000 replica weights. *Source:* HILDA Survey wave 18

decades (Islam and McGillivray 2019; Stiglitz 2012), as economic growth is more beneficial to high-income-earners, and they choose higher saving rates Saez and Zucman (2016). This does not seem to hold for Australian households. The share of households in the sample with zero net worth or less has, however, increased from 7.66 to 11.10 percent. Hence, economic growth does not seem to coincide with broader wealth accumulation.

Going beyond the Gini coefficient, I provide percentile ratios to investigate the tails of the net worth and augmented wealth distribution. Figure 2 depicts the 20/50 and 90/50 percentile of the two aggregates between 2002 and 2018.[33]

The ratios reveal an increase of inequality in both wealth aggregates in the 2010s, which is not captured by the Gini coefficient. The first panel in Fig. 2 shows that households held less than 10 percent of the median net worth at the 20th percentile in 2002 and around 5 percent in 2018, while they hold around 18 percent of the median augmented wealth. The second panel shows that households held 4.1 times the median net worth at the 90th percentile in 2002, increasing to 4.8 in 2018, at the same time holding 3.3 (3.8) times the median augmented wealth in 2002 (2018). As shown with the Gini coefficient above, percentile ratios of augmented wealth exhibit less inequality than those of net worth. However, the differences are more distinct at the top tail of the distribution, i.e. the 90/50 percentile ratio.[34]

It is important to remember that the applied wealth data is top-coded, and survey data potentially does not capture the top adequately. This may explain why other datasets show a more significant increase in inequality in the same period Australian Bureau of Statistics (2021). The 90/50 percentile ratio also hints towards a larger variation at the top. Further, it shows that including social security pension wealth affects the level, but not the inequality trend, as its contribution is relatively constant over time and plays no role at the top of the wealth distribution.

5.1.2 The distribution of augmented wealth in an international comparison

Augmented wealth is a helpful tool to enhance the comparability of wealth data between countries, as it reduces the bias from different social security pension schemes. This allows

[33] I choose those percentiles as they guarantee that individuals hold some positive wealth at the lower end. Table A10 in the Supplement Material B.4 shows the corresponding numbers for all pension wealth aggregates.

[34] Table A10 in Appendix B.4 shows that this is fully attributable to social security pension wealth.

me to compare Australian wealth inequality with Germany, the US Bönke et al. (2019), and Switzerland Kuhn (2020). The pension system in Germany, Switzerland, and the US are all based on public, private, and occupational pension schemes. The public pension in these countries are pay-as-you-go schemes, hence, the present value of the future benefits can be assigned to an individual at any age in their life cycle. As shown above, Australia's pension scheme differs, as it is not conditional on income during the worker's life but on income and wealth endowment starting at the retirement age, and is, therefore, a special case in this group of countries. Furthermore, only the Australian Superannuation scheme and the occupational pension scheme[35] in Switzerland have a compulsory component. The Riester-Scheme in Germany and the 401k-plan in the US are voluntary schemes.

In the following analysis, all values are in US Dollars and purchasing-power-parity-adjusted (PPP). For Australia, one Australian Dollar is equal to 0.90 in US Dollars, i.e. the average exchange rate in 2014, and adjusted with the 1.452 PPP-conversion rate provided by the OECD (2021). For Switzerland, I transform the estimates from Kuhn (2020), where one Swiss Franc equals 1.041 US Dollars and the PPP-conversion-rate is 1.235 in 2015. For a better comparison to Bönke et al. (2019), I exclude vehicles from the Australian wealth aggregates, as it is not asked in Germany and excluded from the US.[36]

Comparison of descriptive statistics I start by comparing mean values and several quintiles of the wealth aggregate w10, w12, w13, and w15 in Table 8. Regarding the mean net worth in Australia, at USD 324,664, it is considerably higher than in Germany (USD 182,329) and Switzerland (USD 223,525) and slightly below the US (USD 337,570). However, the mean social security pension wealth is 4.2 times higher in Germany, 2.6 in Switzerland, and 3.4 times higher in the US. The mean value in Superannuation accounts is higher than those of the occupational and private pension schemes in Germany or Switzerland but lower than the one in the US. Consequently, augmented wealth in Australia sits at a mean value of USD487,822, which is above the one of Germany (USD 472,401) and Switzerland (USD 451,294) and below the US (USD 652,504).

The statistics reveal the differences between the social security pension schemes. As it is only accessible to the retired population in Australia, it accounts for only 24.28 percent of the overall population in 2014. As described above, this is mainly due to the different pension concepts. Two-thirds of the Australian Pension wealth comes, on average, from Superannuation accounts, with 84.33 percent of the households holding some wealth here. The coverage is considerably higher than in the other countries and can be explained by the compulsory nature of the Superannuation scheme.[37] Comparing the values of pension wealth, it shows that the pension wealth of Australian households is proportionally, and in absolute terms, lower than in the other three countries depicted.

These finding holds if I relax the eligibility assumption of social security pension wealth, as shown in Fig. A4 in the Appendix. The extended definition increases the mean social security wealth to USD 70,533 and the theoretical maximum definition to USD 95,728. The coverage of social security wealth increases to 32.78 percent and 48.66 percent, respectively, which is still below Germany and the US. Furthermore, the mean of augmented wealth increases to USD 512,813 (extended), and USD 537,998 (maximum) remains below the US mean. In the baseline definition, augmented wealth in Australia is lower at the 25th percentile than in

[35] In German: "Berufliche Vorsorge"

[36] Kuhn (2020) does not provide information on this, but the SILC survey generally asks for overall wealth, which potentially includes vehicles. Hence, the estimates from Switzerland potentially include slightly more wealth types than the other countries.

[37] Coverage is not provided by Kuhn (2020) for the other compulsory scheme, i.e. Switzerland.

Table 8 Descriptive statistics wealth aggregates

Aggregates	Mean	p25	p50	p75	frac >0
Australia					
w10: Net Worth	324,664	8,368	171,257	406,970	84.53
	(3,850)				(0.29)
w12 Social Security	45,552	0	0	0	24.28
	(921)				(0.33)
w13 Superannuation	117,606	6,198	40,289	123,967	84.33
	(1,686)				(0.27)
w15 Augmented Wealth	487,822	66,474	296,876	636,399	93.84
	(4,953)				(0.19)
Germany					
w10: Net Worth	182,329	0	49,623	228,528	71.64
	(2,287)				(0.23)
w12 Social Security	200,424	68,620	162,780	296,048	93.17
	(923)				(0.21)
w13 Occupational and Private Pensions	89,648	0	13,059	78,352	64.24
	(1,116)				(0.15)
w15 Augmented Wealth	472,401	149,128	326,990	630,784	98.38
	(2,761)				(0.07)
Switzerland					
w10: Net Worth	223,525	12,074	66,870	513,221	n/a
	(7,414)				
w12 Social Security	123,868	52,298	88,915	262,859	n/a
	(688)				
w13 Occupational and Private Pensions	103,901	16,801	51,223	268,932	n/a
	(1,116)				
w15 Augmented Wealth	451,294	116,364	259,388	967,464	n/a
	(7,889)				
United States					
w10: Net Worth	337,570	0	40,001	198,800	73.14
	(5,351)				(0.28)
w12 Social Security	161,481	64,486	124,938	227,458	96.49
	(806)				(0.13)
w13 Occupational and Private Pensions	153,453	0	13,000	140,000	61.68
	(2,227)				(0.4)
w15 Augmented Wealth	652,504	86,311	246,663	608,473	95.83
	(6,710)				(0.14)

Notes: Results from Australia are based on their own calculations in 2014. Australian estimates are transformed into USD (1 AUD= 0.90 USD, average exchange rate in 2014) and PPP-adjusted, with the factor 1.452 provided by the OECD (2021) Estimates from Germany and the US are taken from Bönke et al. (2019). Estimates from Switzerland are taken from Kuhn (2020) and transformed PPP-adjusted USD by using the 1 CHF= 1.041 USD and the 1.235 PPP-conversion-rate OECD (2021). All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18, German and US estimates by Bönke et al. (2019) based on SOEP v30/v31 and SCF 2013, respectively, Switzerland results are based on EU-Silc

Table 9 Gini coefficients

	Australia	Germany	Switzerland	United States
w10: Net Worth	0.661	0.755	0.750	0.889
	(0.0032)	(0.036)	(0.007)	(0.029)
w10 + w12: Social Sec PW	0.622	0.507	0.570	0.585
	(0.0033)	(0.037)	(0.004)	(0.035)
w10 + w13: Occ. / Private PW	0.628	0.705	0.650	0.826
	(0.0031)	(0.034)	(0.005)	(0.031)
w15: Augmented Wealth	0.592	0.508	0.550	0.700
	(0.0032)	(0.034)	(0.008)	(0.033)

Notes: Results from Australia are based on the author's calculations in 2014. German and US estimates are taken from Bönke et al. (2019). Estimates from Switzerland are taken from Kuhn (2020). All statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18. German and US estimates by Bönke et al. (2019) based on SOEP v30/v31 and SCF 2013, respectively, Switzerland results are based on EU-Silc

other countries, however, this does not hold for the extended definition, which is at the same level as the US.

Comparison of the Gini indices The Gini indices of the different wealth aggregates in Table 9 provide further insights into the distributional differences of the wealth aggregates. The net worth Gini coefficient in Australia lies at 0.661, which is lower than the Gini coefficient of 0.755 in Germany, 0.750 in Switzerland, and 0.889 in the US. Adding personal entitlements of social security pension wealth to net worth, the Gini coefficient reduces in Australia by 5.90 percent less than in the other two countries, i.e. 32.84 percent in Germany, 24 percent in Switzerland, and 20.13 percent in the US. Net worth, plus occupational and private pension wealth, reduce the Gini index slightly in all countries. Eventually, augmented wealth in Australia provides 0.592, a higher Gini coefficient than Germany at 0.508 and Switzerland at 0.55 but remains below the one in the US at 0.700. Including augmented wealth, therefore, leads to a different ranking in terms of inequality. Moreover, Superannuation wealth does not reduce wealth inequality more than other occupational pension schemes, but Australia shows a relatively low level of inequality in net worth spurred by a large homeownership rate.

As comparing the Gini index across countries is a core aspect of the analysis, I run another robustness check on Australia, Germany, and the US to further enhance comparability. I re-estimate the Gini coefficients for "w10 + w12" and "w15", setting social security wealth equal to zero if individuals are younger than 50, and compare these estimates to the extended definition of social security wealth in Australia. Table 10 depicts the results. The equalizing effect of social security wealth in "w10 + w12" reduces slightly in Germany with 0.520, compared to 0.507 above, but severely for the US with a Gini coefficient of 0.710 instead of 0.585. Hence, including social security wealth for younger cohorts has an especially large distributional effect in the US. Augmented wealth inequality is now higher in both countries. The Gini coefficient of Australia remains slightly above Germany and below the US. Even though the difference to Germany is less distinct in this configuration, the augmented wealth methodology incurs different patterns than the net worth aggregate, including the lower equalizing power of the pension schemes in Australia.

Table 10 Gini coefficients: robustness check

	Australia	Germany	United States
w10: Net Worth	0.661	0.755	0.889
	(0.0032)	(0.036)	(0.029)
w10 + w12: Social Sec PW	0.599	0.520	0.710
	(0.0035)	(0.038)	(0.034)
w10 + w13: Occ. / Private PW	0.628	0.705	0.826
	(0.0031)	(0.034)	(0.031)
w15: Augmented Wealth	0.572	0.557	0.754
	(0.0032)	(0.034)	(0.033)

Notes: Results from Australia are based on the extended definition of social security wealth in 2014. German and US estimates are adjusted, shutting off the social security wealth in Bönke et al. (2019) for individuals with an age below 50. all statistics are based on imputed values. Bootstrapped standard errors in brackets using 1000 replica weights.
Source: HILDA Survey wave 18. German and US estimates based on SOEP v30/v31 and SCF 2013, respectively

5.2 Superannuation and age pension: what can be learned from the Australian case?

This section analyses the Age Pension and Superannuation in detail. The findings cover several dimensions which are potentially important from a public policy perspective. I argue that policymakers who aim to reform or extend the occupational pension can learn from the Australian case. This section includes three parts: first, it describes the relevance of the schemes, which includes especially the take-up rate of the Superannuation scheme. Second, it inquires about the interaction between Superannuation dissaving decisions and eligibility for Age Pension. Third, the section discusses the distributional implications for the Australian pension schemes in the long run.

5.2.1 Relevance of the pension schemes

One central feature of the Superannuation scheme is its compulsory nature. Accordingly, one would assume an increasing take-up rate for the retired population, especially in the first decades after its introduction. As the analysis above showed increasing mean values in the overall population, I explore here how the relevance of the Superannuation evolved compared to the Age Pension scheme.

I find that the relative importance of the Superannuation scheme rises significantly while the Age Pension remains relatively constant between 2002 to 2018. Figure 3 provides the proportion of retired households with a household head at 55 years of age or higher who receive at least some Age Pension or withdraw some positive amount from their Superannuation account. The proportion of recipients of Age Pension is relatively constant at around 50 percent throughout the considered years. The proportion of individuals withdrawing income from Superannuation accounts, however, increases from around 26 percent to 40 percent. One factor for this increase in the take-up rate is the establishment of the scheme: retired individuals in 2018 were enrolled for a longer period throughout their life cycle in comparison to those in earlier years. Although the establishment of the scheme was affected by the GFC at the end of the 2000s, it did not stop its growing relevance.

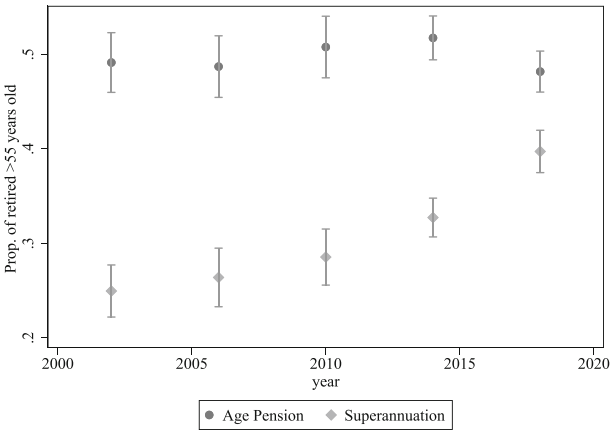


Fig. 3 Age pension and superannuation accounts in australia by wave. *Notes:* Own calculation. Numbers represent the proportion of households with a retired household head over the age of 55 receiving some positive Age Pension and/or some positive amount from their Superannuation accounts. Brackets represent bootstrapped 95 percent confidence intervals. All estimates are weighted with cross-sectional household weights and based on imputed data. *Source:* HILDA Survey wave 18

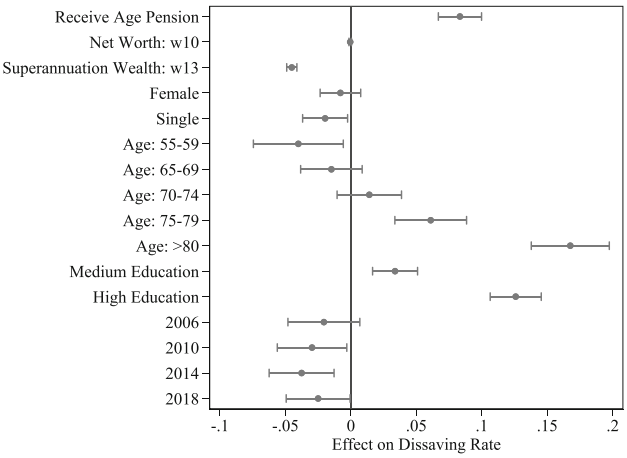
5.2.2 Interaction between the schemes

When a new pension scheme is introduced, it can potentially create incentives and behavioral responses in connection with the established pension schemes, which policy planners may not intend. An interesting feature of the Superannuation scheme is that it leaves choices on the income stream during retirement almost completely to the individual who reaches the preservation age. While many rules apply during the accumulation phase, no dissaving rules apply from this point. Aside from consumption purposes, however, the tax advantages from the scheme leave little incentives to transfer wealth away to other financial investments. In what follows, I scrutinize whether Age Pension interacts with dissaving decisions of Superannuation accounts, either through its function as an indirect tax or its insurance function for risky financial investments. Moreover, I analyze whether dissaving varies along the wealth distribution.

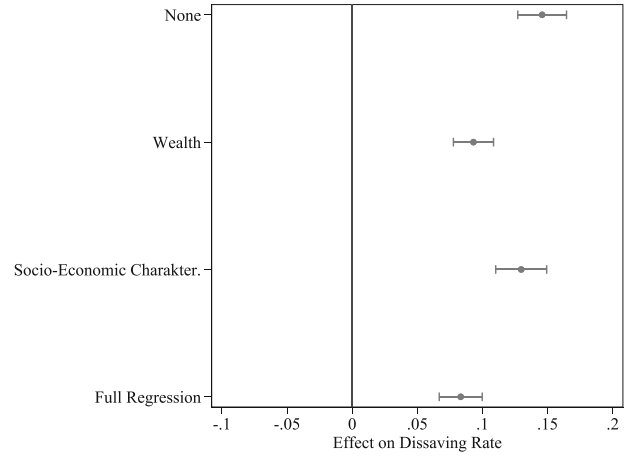
I provide the results of the pooled fractional probit model with the dissaving rate as an independent variable, to understand how they vary across several socio-economic characteristics, e.g. age, household types, education, and wealth endowments. The working sample is based on 5,679 retired individuals in five waves who hold at least some wealth in their Superannuation account. I present the marginal effects at the mean (MEM) of the covariates on the Superannuation dissaving rate with the 95 percent confidence interval in Fig. 4. The MEM describes the partial effect of the independent variable when all other covariates are set at their means.[38] The upper panel of Fig. 4 provides the MEMs for all covariates used in the regression, and the lower panel demonstrates results for several model specifications for the binary variable, which is equal to 1 if individuals receive Age Pension.

The regression results provide several insights into dissaving at retirement. First, Australian retirees seem to react to the indirect tax function of Age Pension and dissave their accounts faster, potentially to qualify for (higher) Age Pension. This is in line with (Butt et al. 2021; Hulley et al. 2013; Spicer et al. 2016) and in the range of the results by (Asher et al.

[38] The full model, as well as OLS estimates, are provided in Appendix A.6.



(a) Marginal Effects at the Mean from Covariates on the Dissaving Rate



(b) Effects of Age Pension on Dissaving Rates for Different Model Specifications

Fig. 4 Regression results of the fractional probit: marginal effects at the mean. *Notes:* Own calculation based on retired individuals over 55 years of age. Panels provide the marginal effects at the mean for several covariates. The confidence intervals are specified at the 95% level. The upper panel provides the full set of the main regression. The lower panel shows the marginal effect at the mean from those receiving Age Pension for several different model specifications. Net worth and Superannuation wealth are divided by $100,000. The y-axis describes the set of covariates included in the regression. All statistics are based on imputed values. *Source:* HILDA Survey wave 18

2017), who find 9 percentage points higher dissaving rate for those subject to Age pension asset tests between 1999 and 2007. The effect size is not trivial: for the average individual, the dissaving rate is 8.33 percentage points higher per year. A back-of-the-envelope calculation would suggest that, all else equal, a fund of $100,000 would reduce to $24,106 in 5 years, instead of the $35,891 at the mean dissaving rate (21.6, see table above) of the working sample. The estimate is robust to several specifications of the fractional probit model. The lower panel provides the results of those receiving Age Pension with different model

specifications. The estimate of the full regression is the lower bound:[39] adding only wealth or socio-economic characteristics as covariates to the Receive Age Pension dummy variable does not change the significance of the result.

Second, the effect of net worth is statistically and economically zero, while wealth in Superannuation wealth is negatively associated with the dissaving rate. Hence, wealth levels of financial assets and housing investments, which are the most relevant in net worth, do not seem to drive the individual dissaving rate decision in this specification.[40] Nevertheless, the negative coefficient of Superannuation wealth points towards heterogeneous dissaving rates along different levels of wealth; an increase of $100,000 decreases the dissaving rate at the means by 4.51 percentage points. This means that, on average, the dissaving rate reduces to zero dissaving, as detailed in (Hulley et al. 2013; Spicer et al. 2016), for wealthier households holding around $500,000 or more in Superannuation accounts. Finding this effect explicitly for Superannuation wealth may indicate the presence of an insurance effect as described in (Andréasson et al. 2017; Asher et al. 2017; Butt et al. 2021; Hulley et al. 2013). However, the hedging effect is potentially not the only driver, as it the insurance function is not binding for very large levels of wealth Productivity Commission Inquiry Report (2018). Thus, this can also be influenced by the relatively higher tax advantage for holding wealth in Superannuation accounts for individuals in higher marginal tax brackets. This can reflect in the lower dissaving rate of Superannuation accounts, as it is more efficient to dissave other means of investments first.

The socio-economic characteristics show that women do not dissave significantly differently from men. Single households extract slightly less than those living in coupled households, but the estimate is only significant at the five percent level. A negative coefficient could indicate higher exposure to income risk, as household pooling is impossible, therefore choosing more prudent rates. The age dummies reveal a clear increase in age, significant from the 75-79 bracket.[41] A bequest motive could limit the excess of the dissaving rate, as Superannuation wealth is not subject to inheritance or other additional tax that affects the transition to the closest kin. Individuals with a medium level of education, here classified as at least 12 years of schooling and less than a bachelor's degree, and those with a higher level of education, dissave relatively more. It is not straightforward to qualify the result, as a higher dissaving rate on average is per se not more or less efficient. I also include year dummies in the regression, showing that the year-specific conditional mean of the dissaving rate reduces over time. This is maybe explained, again, by the growing maturity of the Superannuation scheme along with increasing life expectancy. Naturally, these are long-term trends and, therefore, probably do not dominate the choice of the dissaving rate.

I conclude that I find suggestive evidence for individuals' reactions due to the provision of Superannuation wealth and the Age Pension eligibility test. The income and asset tests can be considered as an implicit tax on Superannuation wealth, as it reduces or hinders social

[39] The OLS regression provides a similar effect size, which is provided in Appendix A.6.

[40] This result comes with the caveat that net worth is measured on the household level. By sharing resources, many components could affect the individual dissaving decision, e.g. joint consumption decisions or tax considerations. Moreover, those who receive Age Pension passed the income and asset test, which therefore captures the net worth effect. However, (Andréasson et al. 2017) find that the effect pooling effect on Superannuation dissaving is small. If only financial wealth or additional housing wealth is included instead of net wealth as a covariate, the coefficient remains around zero. Regression results are available upon request.

[41] Previous studies on optimal retirement decisions under Age Pension would suggest higher dissaving rates at early retirement Hulley et al. (2013). However, this is captured in the Age Pension dummy. Higher compulsory drawdown rates may also affect these estimates, as they are quite heterogeneous across time and age Sneddon et al. (2016). Another credible factor would be the decreasing insecurity over an individual's life expectancy (see Australian Government (2020)).

security payments, but only for some, i.e. for those who would receive the full or partial pension without Superannuation wealth in the picture. Additionally, I find suggestive evidence for the presence of the insurance function of Age Pension. This bears several concerns: first, as found in previous studies, the implicit tax and insurance effect of Age Pension may force individuals to choose inefficient dissaving rates, in regards to consumption smoothing or insurance decisions, especially in the wake of increasing health and mortality risks with age (Andréasson and Shevchenko 2017; Butt et al. 2021; Hulley et al. 2013). Second, the insurance function of Age Pension may lead to higher exposure to idiosyncratic labor market risk, especially for inept or aging investors Earl et al. (2015). Third, the policy may encourage individuals who are potentially eligible for Age Pension to reduce contributions to their Superannuation scheme before retirement. As the contribution is linked to the employment status, this could lead to distortions, i.e. lower supply in the labor market. Fourth, in combination with the nearly unlimited access after the preservation age, this could contribute to tax evasion strategies, transferring wealth into less traceable means, i.e. cash or wealth in accounts overseas. Quantifying the costs and relevance of the last two concerns would be an interesting subject for future studies.

5.2.3 Discussion: superannuation and inequality in the long run

The evolution of Superannuation wealth shows an increase in the wealth endowment for many Australians during the 2002 to 2018 period. Especially its compulsory component seems to support a broad range of households to accumulate wealth for retirement. As this compulsory component of the scheme was 26 years old in 2018, nearly a whole generation participated in the scheme in the last period of this study. In what follows, I discuss the distributional implications of the scheme from an inter-generational perspective.

Wealth in Superannuation accounts increases along with the augmented wealth distribution. Figure 5 provides generalized concentration curves of Superannuation wealth along the population ordered by augmented wealth. The cumulative mean of Superannuation increased more at the upper end of the augmented wealth distribution, while over 15 percent did not accumulate any Superannuation wealth at all. This pattern is not surprising, as the Superannuation Guarantee depends on monthly labor income, which is highly correlated with wealth. Moreover, the tax incentives are higher for those at the upper end. Even though the maximum contribution cap was reduced in the 2010s, this did not stop these dynamics, as there is a significant increase between 2014 and 2018.

While the observed *intra*-generational period of the scheme seems to affect overall wealth inequality only to a small extent, my results incorporate concerns about the distributional consequences of *inter*-generational transfers in the future. Connecting this finding to my analysis above, where I observe higher wealth levels at the end of the life cycle in 2014 and 2018, inheritances from Superannuation accounts will play a vital role for younger age cohorts in the coming decades. My analysis also shows that higher amounts of Superannuation wealth are associated with lower dissaving rates. This can indicate higher remainder values for larger Superannuation accounts. Then, the effect on inequality depends, all else equal, on the dispersion of Superannuation wealth across the augmented wealth distribution. As the concentration curve in Fig. 5 shows that Superannuation wealth is higher at the upper end of the augmented wealth distribution. Even though this does not increase the share of Superannuation wealth between 2002 and 2018, inter-generational transmissions could potentially lead to an increasing concentration of Superannuation wealth in the long run.

The implications of this scenario of these and other wealth transfers for overall inequality in Australia depend on numerous factors, which are extensively discussed in Productivity

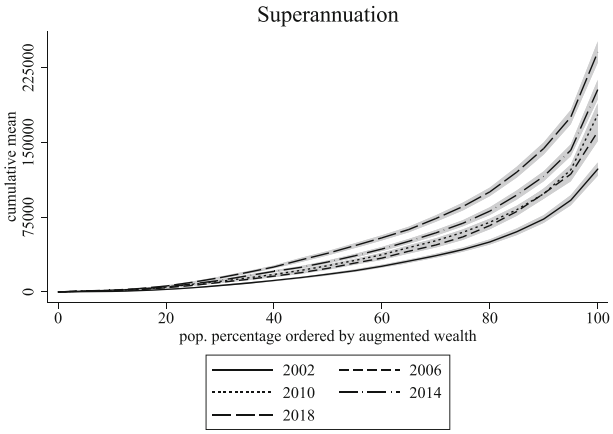


Fig. 5 Generalized concentration curves of superannuation and augmented wealth: 2002 to 2018. *Notes:* Own calculations based on the full sample. Generalized concentration curves of Superannuation from 2002 to 2018. Values are in AUD and set to 2018 prices on the basis of the Consumer Price Index The World Bank (2021). The grey area represents 95 % confidence intervals. *Source:* HILDA Survey wave 18

Commission Inquiry Report (2021). While the baseline simulation in the report points towards a reduction of wealth inequality due to transfers, this may be reversed if wealthy households receive larger - and save more of their inheritances. The latter could be leveraged by the divergence in tax advantages along the distribution, as the tax advantage is at 4 percent for the lowest tax rate and 30 percent at the highest margin. As retirees at the lower end of the wealth distribution dissave Superannuation faster, they drop out of the scheme completely. This will ultimately increase the dispersion between retirees receiving Age Pensions and those using Superannuation accounts, entailing the risk of a two-tiered retirement system.

Further welfare analysis is needed to evaluate the long-term welfare effects. Kudrna (2016) provides a framework evaluating the welfare changes for adjusting Age Pension regimes for two generations, proposing more restrictive means-testing and lower income taxation rather than increases in the eligibility age. Nevertheless, both policies suggest a larger dependence on the Superannuation scheme, which can lead to a higher concentration of Superannuation wealth. Adding the welfare increases and losses of Superannuation wealth transfer dynamics, as well as the effect of the introduced 1.6 million cap to the tax-exempt status in 2017, into the framework by Kudrna (2016) would be another insightful alley for future research.

6 Conclusion

This paper shows that the levels of net worth and augmented wealth inequality in Australia are persistent over time. This coincides with large wealth gains during the 2000s, which were driven by increases in housing values, accompanied by relatively high homeownership and large gains in Superannuation accounts. Wealth gains are the most profound for households with a household head over 50 years of age.

In an international comparison, Australia exhibits relatively high values of net worth but relatively low values of pension wealth. Net worth is more equally distributed than in Germany, Switzerland, or the US. However, adding pension wealth reduces the Gini coefficient less than in the other countries, so augmented wealth in Australia is slightly less

equally distributed than in Germany and Switzerland. Low levels of wealth inequality in Australia rather stem from high homeownership rates rather than from pension wealth. My analysis includes a policy analysis of the Australian pension schemes and the lesson that can be learned from the Australian case. The Superannuation scheme helps to increase wealth endowment for the retired population generally and, thus, there is a high take-up rate, also due to its compulsory nature. Age pension payments remained stable over the considered period. My analysis finds that retirees dissave their Superannuation accounts faster during retirement if they are eligible for Age Pension, potentially reacting to the implicit tax that the means-test of the scheme imposes. Moreover, I find suggestive evidence for an insurance effect, as the dissaving rate decreases with Superannuation wealth. Nevertheless, this could also be supported by increasing tax advantages in the scheme. Further, I argue that there is a risk of a two-tiered retirement system: those depending on Superannuation and those depending on Age Pension, which may be enhanced by *inter*-generational transmissions and dispersed tax incentives along the wealth distribution in the future and outline further promising alleys for researchers.

Beyond the scope of this article, there are potentially more lessons to be learned from the Australian pension scheme. Policy planners also need to be aware that Superannuation imposes further risk on the population, i.e. financial market – and institutional risk. As Superannuation wealth is invested into the stock market, individuals in the maturing Superannuation scheme face more financial market risk in their household portfolios. This can have severe consequences when individuals close to retirement face a sudden downward trend in the financial markets, e.g. as seen lately in the COVID-19 crisis. The government could provide aid in these situations to prepare individuals to re-balance their portfolios before retirement. Over the years, the Superannuation scheme has been transformed and adjusted regularly. Naturally, the scheme is shaped by partisan policies, e.g. the initial plans of one administration for significant increases in the Superannuation Guarantee were reduced and postponed by the successor. While fundamental parameters, like the compulsory nature of the contributions, are not affected, the scheme bears some institutional risk.

I conclude that policy planners need to set a solid saving and extraction framework so that the tax schedule and the scheme itself do not set adverse incentives when introducing an additional pension scheme. Simultaneously, the planners need to minimize potential deadweight loss effects, i.e. lessen the number of individuals attending the scheme for tax advantages without adjusting their actual ceteris paribus saving behavior. The set of rules for a new scheme also needs to consider its distributional consequences carefully, as long-term imbalances are difficult to address with ex-post policies.

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Data Availability Statement The dataset for the entire analysis is the Household, Income and Labour Dynamics in Australia Survey, which is available to every research institution worldwide after an application process.

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